PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION

The proposed permit area is situated in-between Preacher Creek and Looney Creek. The proposed permit area consists of approximately 46.54 acres.

Pre-SMCRA surface mining operations have been conducted on portions of the Marker and Taggart Seams in the proposed permit area. Post-SMCRA underground mining has taken place in the Imboden Seam in the proposed permit area. Post-SMCRA mining in the Marker Seam has also taken place within the permit area.

Pre-SMCRA deep mining operations have been conducted in the Marker Seam within the proposed permit area. The underground mine works are shown on the **Hydrology** Map.

Groundwaters

The proposed impact area lies primarily within side slope and ridge top land forms, which show little potential for the development of significant aquifers. The lithology of the impact area is composed exclusively of alternating beds of shale, sandy shale, sandstone and coal. Shales and sandy shales are extremely fine-grained and exhibit very low primary permeability. The sandstone strata are generally more porous; however, they are so well cemented that they are likewise poor media for the transmission of groundwater.

In undisturbed areas, research shows that due to the low primary permeabilities of most stratigraphic units in the Appalachian Physiographic Province, groundwater movement is principally controlled by topography and secondary permeability (movement of groundwater along fracture system, bedding planes, joints, faults, etc.). Of primary importance are fracture systems resulting from stress-relief or unloading effects. The results of recent studies indicate this fracture-flow zone is normally limited to the uppermost 150 feet of overburden. In undisturbed areas, below the fractured zone, the only lithologic units with significant transmissivity are coal seams and even this decreases as depth increases. Recharge of the coal seams is through deep vertical fractures. Springs are often associated with coal seam

outcrops and their associated perched aquifers. This is because the coal seams are relatively permeable and are often underlain by relatively impermeable strata. These aquifers may be of sufficient quantity and quality to supply a small number of households but are of little regional significance as water sources. There are no developed sources of groundwater located within one-half mile of the permit boundary.

In undisturbed areas, ground water originates as precipitation, migrates through the soil and colluvium, and enters the stress-relief and/or tectonic fracture systems in upper-slope or highland terrain. Ground water movement continues down-gradient to the valley floor fracture system. The coal seams may act as aquifers, with cleating providing secondary permeability and the underclays acting as aquitards to isolate the unit as a perched aquifer. Thus, the general down-slope flow is altered to a down-dip movement, exiting as springs at the seam outcrops. Ground water may emerge as contact or colluvial springs, but overall movement is to the streams and underlying fractures.

Groundwater flow in upper slope landforms at this site is primarily controlled by the post-SMCRA underground mine works. Except for the mine discharges associated with Imboden mine works, there are no other known springs within or adjacent to the area to be permitted.

Groundwater baseline points document the quality and quantity of groundwaters underlying and within the area to be amended. All baseline data is contained in Item 5.5, Groundwater Baseline Data. The quality of the mine discharges is generally good.

The during mining and after mining Groundwater points will consist of the same Groundwater points that were used for baseline. GW-1 and GW-4 are alluvial wells, GW-2, GW-3 and GW-5 are mine discharge points. A description of each can be found in Item 5.5. These points are adequate to determine impacts to Groundwater resources of the area.

Results of the overburden characterization program, contained in Item 4.4, indicate that the occurrence and disturbance acid/toxic units will be minimal. These units are thin, relative

to the highwalls proposed, are of limited areal extent and the remaining overburden exhibits moderate neutralization surpluses. If the acidic material is exposed through mining, then the acidic material will be encapsulated with non-acidic material. See Attachment 15_1.

In summary, the vast majority of overburden to be disturbed at this site has moderate neutralization potentials. Because of these characteristics, no adverse effects to the quality of groundwaters at this site are anticipated as a result of operations proposed under this application. Groundwaters originating from the operation are expected to exhibit relatively high pH's and buffering capacities.

The surface mining operation will remove the Marker and Taggart seams with a majority of the mining area to be removed through area mining and a small portion removed through the contour mining methods.

The effect of the operation on the quantity of groundwaters is expected to be a slight increase. This increase is expected because infiltration rates will increase because native soils and solid overburden will be replaced with mine soils and fractured overburden. Groundwaters entering these areas will flow down gradient to solid rock pit floors and eventually enter the valley floors of Preacher Creek and Looney Creek.

No significant effects are expected on the pre-SMCRA deep mines that will be mined through and reclaimed under this application. The surface mining operation is not expected to have any appreciable hydrologic or hydraulic effects on the deep mine systems. In summary, no significant hydrologic or hydraulic impacts on the deep mine works are expected from the surface mining operation.

In conclusion, no significant, long-term detrimental impacts to the quantity or quality of groundwater resources are expected because of operations proposed under this application. A minor, short-term increase in dissolved solids may occur because of the weathering and dissolution of minerals exposed on the fresh rock surfaces created by excavation at the site.

However, this effect should stabilize after reclamation operations are completed and revegetation is achieved. Therefore, the probable hydrologic consequences of the operation on groundwater resources are expected to be no significant, detrimental long-term impacts. The proposed operation is not expected to result in contamination, diminution or interruption of a source of groundwater used for domestic or other legitimate purposes.

Groundwater References: James A. Kipp and James S. Dinger, Stress Relief Fracture Control of Ground-Water Movement in the Appalachian Plateaus, Kentucky Geological Survey

Surface Waters

Unnamed tributaries to Preacher Creek and Looney Creek will receive discharges from the proposed permit area. The lower reaches of the Unnamed tributaries to Preacher Creek and Looney Creek are intermittent/perennial streams. They have been impacted by pre-SMCRA surface mining operations.

Baseline data is contained in Item 5.9, Surface Water Baseline Monitoring. The locations of all surface water baseline and in-stream monitoring stations are shown on the **Hydrology** Map. The data indicates that the quality of all receiving streams is relatively good.

During mining, the rate of interception of storm precipitation by vegetation and other forms of cover will decrease due to the removal of vegetation. However, the availability of depression storage over the drainage area will increase due to the installation of sediment control structures and open mine pits. Upon completion of mining, the rate of rainfall interception should gradually return to its approximate pre-mining condition as vegetation becomes re-established. The infiltration rate will probably increase slightly over pre-mining

conditions due to the coarser texture of the backfill material and the depression storage should approximate the conditions prior to watershed disturbance.

All drainage from the proposed permit area will pass through approved sediment control structures prior to exiting the area to be permitted. The proposed sediment control structures should effectively control sedimentation from the operation and provide adequate detention time to minimize the effect of increased runoff during mining.

As might be expected with any new disturbance, a temporary increase in suspended and settleable solids concentrations is expected from the runoff on the permit during the period of initial disturbance and ongoing active mining operations. However, with the designed sediment control structures in place prior to these land-disturbing activities, sediment will be trapped and the solids content of the runoff reduced to an acceptable level before being discharged. Discharges from the sediment structures will be monitored regularly and are expected to meet the applicable NPDES limitations.

During mining there will be an increase in the levels for TDS, conductivity, and sulfate. However, proper mining techniques and reclamation practices will cause the levels to be minimized as much as possible during mining and to subside over time. It is anticipated that TDS, conductivity, and sulfate will be trending downward prior to bond release.

Prediction of potential acid-producing conditions is based on the overburden acid-base account for the mine site. The accounting does not show an excess of acidic material that could cause potential problems like the possibility of low pH. In fact, it is quite the opposite; in the areas where there will be disturbance, the acid-base results indicate that an overall excess of alkalinity is present in the vast majority of the overburden material. The only strata that have excess acidity are the coal seams which will be removed. Any unsampled strata where there was core loss is a small percentage of the total geologic column and encapsulation of the overburden during the normal site excavation process will be a positive

net neutralization potential. Therefore, there is little potential for the development of acid mine drainage from the proposed mining. Consequently, the pH of surface runoff should remain in the neutral range or be slightly alkaline. It is expected that the surface runoff will remain slightly alkaline, and any increases in sulfate or dissolved solids will be insignificant over time.

No significant changes in pH, iron or manganese concentrations are expected because of the proposed operations.

Upon completion of the coal removal process, the establishment of an effective post-mining vegetative cover should restore the runoff and recharge rates to the approximate pre-mining levels. Post-mining base flows will probably be somewhat higher and post-mining peak flows should be somewhat lower than pre-mining conditions.

Post-reclamation discharges should be of relatively good quality with a pH near-neutral, slightly alkaline, and low concentrations of iron and manganese. No significant quantities of acid/toxic overburden will be generated by the operation. No significant changes in the quality or quantity of underground mine discharges will occur because of the operation. Because of these factors, no significant, long-term detrimental effects to the quality of surface waters are expected within, or downstream of, the proposed permit area.

In conclusion, no significant, long-term detrimental impacts to the quantity or quality of surface water resources, located within or downstream of the proposed permit area, are expected because of operations proposed under this application. The proposed operation is not expected to result in contamination, diminution or interruption of a source of surface water used for domestic or other legitimate purposes.